

REMARKS

Applicants acknowledge the Examiner's indication that claims 16, 19-22, and 28 are allowed and claims 2-5, 11-14, and 25 are allowable if rewritten in independent form. Applicants have amended claim 1 to incorporate claim 2. Therefore, claims 1, 3-15 and 41 are in condition for allowance. Claims 11, 12, and 25 have been rewritten as independent claims 36, 37, and 40, respectively. Therefore claims 36-40 are in condition for allowance.

The Examiner has objected to the title of the application. While applicants do not agree that the title is not descriptive, to expedite prosecution, applicants have amended the title.

The Examiner has rejected claims 27 and 29 as being anticipated by Goto (U.S. Patent No. 5,931,645).

Claims 27 and 29 are patentable over Goto.

Claim 27, as amended, recites "a centrally located actuating mechanism including a transition arm coupled to a stationary support by a U-joint and to a rotary member." Goto does not describe or suggest the use of a U-joint to couple a transition arm to a stationary support. Therefore, for at least the reasons discussed above, applicants submit that claim 27 is patentable over Goto.

Claim 29, as amended, recites a metering pump that includes "a plurality of fluid-pumping piston cylinders... wherein an axis of the first cylinder is spaced from the actuating mechanism a distance that differs from a spacing of an axis of the second cylinder." Goto does not describe or suggest the claimed spacing of piston cylinders. While the cylinder bores 7 and 8 of Goto have different diameters, the cylinder bores 7 and 8 are positioned radially about the swash plate 25, which the Examiner equates to the claimed actuating mechanism, in such a manner that the axes of the cylinder bores 7 and 8 are equidistant from the swash plate 25. Therefore, for at least the reasons discussed above, applicants submit that claim 29 is patentable over Goto.

The Examiner has rejected claims 23, 24, 26, and 31 as obvious over Goto. Claims 23 and 31 are in independent form.

Claims 23 and 31 are patentable over Goto.

Claim 23, as amended, recites a metering pump including “a drive shaft; an actuating mechanism coupled to the drive shaft; and a plurality of piston cylinders arranged radially about the actuating mechanism ..., wherein at least part of the actuating mechanism is located between the piston cylinders.” Goto does not describe or suggest at least part of an actuating mechanism being located between piston cylinders.

The Examiner states that:

The actuating mechanism was identified as swash plate (25). Since the rotary shaft (shown not enumerated) in Figure 1 actuates the swash plate (25), technically, it is the combination of the plate (25) and the drive shaft that actuates the pistons (29, 30). As shown in Figure 1, a portion of the shaft is located between the piston cylinders (7, 8).

Claim 23, as amended, recites the drive shaft and the actuating mechanism. While Goto's drive shaft is located between piston cylinders, Goto's swash plate is not. Nor would it be obvious to position Goto's swash plate between piston cylinders since Goto's swash plate is configured to drive the ends of the pistons. Therefore, for at least the reasons discussed above, applicants submit that claim 23 and its dependent claims are patentable over Goto.

Claim 31, as amended, recites a metering pump including “an actuating mechanism, and a plurality of piston cylinders..., wherein each cylinder of the plurality of cylinders has a working volume that differs from the other cylinders and at least part of the actuating mechanism is located between the piston cylinders.” Goto does not describe or suggest the recited plurality of piston cylinders each having a different working volume.

The Examiner states that:

The Goto et al. device differs from the claimed invention in that there is no disclosure of each cylinder having a working volume that differs from the other cylinders. Within the art, it was well known that swash plates contain various numbers of piston cylinders depending on the compression capacity required. Goto et al. discloses two sets of pistons with different cylinder diameters. It would have been obvious to one of ordinary skill in the art at the time the invention was made to reduce the number of cylinders, in a lower compression capacity requirement. With the lower compression capacity variation, it would have been further obvious to maintain the use of pistons with different working volumes, i.e., inner diameters, as taught by Goto et al., in order to achieve different compression stages as required.

In accordance with MPEP §2144.03, applicants respectfully request that the Examiner cite a reference in support of the assertion that it was well known that swash plates contain various numbers of piston cylinders depending on the compression capacity required. Furthermore, Goto

teaches away from a pump/compressor design that has a plurality of piston cylinders that each have a different working volume. As stated by Goto in col. 1, lines 21-49, an unbalanced force is generated on the swash plate and the drive shaft of a compressor that has cylinder bores of different pressures (i.e., working volumes) arranged unevenly around the drive shaft.


Accordingly, Goto teaches a compressor which has sets of equal working volume cylinder bores arranged at equal angles around the longitudinal axis (col. 2, lines 2-8, Figs. 2-5) of the drive shaft in order to balance the forces on the swash plate and drive shaft. It would therefore not have been obvious to modify the cylinders of Goto as proposed by the Examiner.

Therefore, for at least the reasons discussed above, applicants submit that claim 31 is patentable over Goto.

The Examiner has rejected claims 17, 30, 33, and 34 as obvious over Forster (U.S. Patent No. 4,449,444). Claims 17, 30, and 33 are in independent form.

Claim 17 relates to a method of metering fluids including independently adjusting stroke of one piston of a plurality of pistons to adjust the volume of metered fluid, claim 30 relates to a metering pump including an adjustment mechanism configured to independently vary the spacing of one piston cylinder of a plurality of piston cylinders from an actuating mechanism to independently adjust the stroke of a piston in the one piston cylinder, and claim 33, as amended, relates to a pump for mixing fluids including an adjustment mechanism configured to independently adjust the stroke of each piston in each cylinder. The Examiner states that "it is old and well-known in the compressor art to vary the number of piston cylinders in order to achieve the proper compression capacity." In accordance with MPEP §2144.03, applicants respectfully request that the Examiner cite a reference in support of this assertion. Furthermore, it would not have been obvious to one skilled in the art to modify the piston pump of Forster by removing one of pistons 19 and one of pistons 25. In particular, removing one of pistons 19 and one of pistons 25 would cause a load imbalance thus increasing vibration and wear, and would adversely affect the smoothness of the fluid flow in the pump. Furthermore, to achieve the desired capacity of a pump, one need only change the speed of the pump.

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Therefore, for at least the reasons discussed above, applicants submit that claims 17, 30, 33, and 34 are patentable over Forster.

Applicants submit that all claims are in condition for allowance.

Enclosed is a check for excess claim fees and a petition for extension of time. Please apply any other charges or credits to deposit account 06-1050.

Respectfully submitted,

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